



## Original Article

## Comparison of Pain Determination Between Celecoxib Tramadol in Third Molar Surgery

Eshnawar Ishaque<sup>1</sup>, Suneel Kumar Punjabi<sup>1</sup>, Mahavosh Qazi<sup>2</sup>, Faiza Hasan<sup>3</sup>, Zunair Akbar Memon<sup>4</sup>, Sadia Hassan<sup>5</sup> and Salman Shams<sup>6\*</sup><sup>1</sup>Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan<sup>2</sup>Department of Oral Medicine, Sir Syed Medical and Dental College, Karachi, Pakistan<sup>3</sup>Department of Pharmacology, Fatima Jinnah Dental College, Karachi, Pakistan<sup>4</sup>Department of Oral Medicine, Isra Dental College, Hyderabad, Pakistan<sup>5</sup>Department of Oral Biology, Isra Dental College, Hyderabad, Pakistan<sup>6</sup>Department of Oral Medicine, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan

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## \*Corresponding Author:

Salman Shams

Department of Oral Medicine, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan  
salman.shams@lumhs.edu.pkReceived Date: 17<sup>th</sup> April, 2024Acceptance Date: 25<sup>th</sup> June, 2024Published Date: 30<sup>th</sup> June, 2024

## ABSTRACT

Selecting a reliable and well-tolerated analgesic to manage pain after surgical extraction of the third molar is still a difficult task. **Objective:** To compare the effect of celecoxib and tramadol in managing post-operative pain following third molar surgery. **Methods:** This cross-sectional research was conducted at the Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences, Jamshoro. A total of 100 patients were included and equally allocated into two groups. Group-A received celecoxib, and Group-B received tramadol. Patients were assessed on follow-up visits on the 1st, 3rd, and 5th days post-surgery. **Results:** Data revealed a mean age of  $28.72 \pm 3.844$  years for Group-A (celecoxib), consisting of 30 (60%) males and 20 (40%) females out of 50 respondents. Group-B (Tramadol) exhibited a mean age of  $28.28 \pm 3.511$  years, including 29 (58%) males and 21 (42%) females. Preoperational and 1st day post-operational pain scores were similar for celecoxib and tramadol (median 8), with no significant difference ( $p$ -value= 0.180 and  $p$ -value= 0.874). By the 3rd day, celecoxib patients reported significantly lower pain (median 3, IQR 2-4) compared to tramadol (median 5, IQR 4-6),  $p < 0.001$ . On the 5th day, celecoxib also had significantly lower pain (median 0, IQR 0-1) than tramadol (median 1, IQR 0-2),  $p < 0.001$ . **Conclusions:** The study concludes that celecoxib is more effective than tramadol in mitigating pain following third molar surgery.

## INTRODUCTION

The surgical procedure of extracting third molar teeth (wisdom teeth) in dentistry includes pericoronitis, disruption to neighboring teeth, related pathology, and non-restorable carious lesions and/or pulpal pathology [1, 2]. Local anesthesia is commonly used for third molar surgery, but more complicated cases may require General Anesthesia (GA) [3]. Inadequately treated postoperative pain can significantly impact the quality of life of patients [4, 5]. Despite the introduction of modern pain control guidelines and pharmacological advancements, the

management of postoperative pain in this context is often insufficient [6, 7]. Celecoxib and tramadol (NSAIDs) which are commonly used for pain management and are well known for the inhibition of cyclooxygenase COX1 and COX2 enzymes where COX1 is presented throughout the body and synthesizes protective prostaglandins in tissues such as the gastric mucosa, kidneys, and platelets, while COX2 is primarily expressed during inflammation [8-10]. However, the use of NSAIDs is contraindicated in individuals with peptic ulcers, bleeding disorders, aspirin allergy, or those

taking anticoagulants or corticosteroids [11]. In such cases, tramadol may be a suitable alternative. Tramadol is a centrally acting mild mu-opioid receptor agonist and inhibits the reuptake of nor-adrenaline and serotonin, making it effective for managing mild to severe pain globally. On the other hand, celecoxib primarily inhibits COX2 [12]. Certain studies have investigated the efficacy of medications like tramadol and celecoxib during third molar surgery, there is limited research comparing the effectiveness of oral celecoxib and tramadol for postoperative pain management after surgical extraction of third mandibular molars.

Hence, the aim of this research is to compare the analgesic potency of these medications. In maxillofacial surgery, third molar extraction is routine but can result in significant postoperative issues [13]. This study evaluated how celecoxib and tramadol mitigate these complications. This study aimed to examine the effectiveness of celecoxib and tramadol in managing postoperative pain following surgery for third molar impaction, thereby contributing to the development of personalized pain management strategies in this surgical domain.

## METHODS

The study employed a comparative cross sectional design utilizing a cross-sectional comparative approach and was utilized with a convenient non-probability sampling technique at Oral and Maxillofacial Surgery Department, Institute of Dentistry, Liaquat University of Medical Health and Sciences Jamshoro from Dec 2020 to May 2021. Sample size was calculated through online sample size calculator Openepi Version 3.01 [  $DEFF * N_p (1-p) / [(d^2 / Z_{2-1-\alpha}^2 * (N-1) + p * (1-p))]$  ]. Confidence limits as % of 100 (absolute +/- %) (d): 5%. A total 100 patients were enrolled and were equally divided in 2 groups of celecoxib and tramadol as Group A and B respectively. The study's ethical approval was provided by research ethics committee of Liaquat University of Medical and Health Sciences, Jamshoro (NO. LUMHS/REC/-980). Patients with either gender from the age 18-45 having mesioangular impacted lower third molar were included. Patients with Gastroesophageal Reflux Disease (GERD), Gastrointestinal Tract (GIT) upset or medically compromised patients having any malignancy, pregnant / lactating women, or patient having NASIDs allergy were not included in this study. Eligible participants who have provided informed consent. Patients were randomly assigned to treatment groups using the Port Chit process. Data was collected by predesigned questionnaire from the patients like postoperative pain score using Visual Analog Scale (VAS) along with age and gender. The VAS ranging from 0 (no pain) to 10 (worst pain imaginable) associated with mesioangular impacted mandibular third molars [5]. The extraction procedure was adhered to standard protocols under local anesthesia administered

using traditional nerve block techniques, involving two 1.8 mL cartridges of 2 percent xylocaine with epinephrine 1:100,000 (sourced from Korea) and supervised by a qualified individual. Surgical procedure involves using a sterile carbon steel surgical blade #15 (Feather Protection Razor Co. Ltd., Japan) for incision and a straight elevator for tooth elevation. Tooth extraction is performed meticulously, aided by circular bur in a slow-speed turbine with copious 0.9% saline irrigation (Searle Ltd., Pakistan), and instruments from Johnson & Johnson (USA). Hemostasis is ensured with sterile gauze (2 x 2) for 30 minutes. Post-surgery, patients receive Tab Augmentin 625mg BD, Tab Sanofi Aventis Palestine Metronidazole, and either Tab Flagyl 400mg BD, Tab Celbex Celecoxib 100mg, or Tab Tramadol 100mg BD for pain management till next follow-up, alongside 5-day course of GlaxoSmithKline antibiotics (Amoxicillin + clavulanic acid). Follow-up appointments to determine the pain level were scheduled on the 1st, 3rd, and 5th days. The data was analyzed using SPSS version 22.0. Frequencies and percentages were calculated for categorical variables, while mean and SD  $\pm$  will be computed for continuous variables like age and pain score. Normality of pain score was assessed using Shapiro Wilk test. Pain score was skewed ( $p=0.013$ ). So non-parametric test i.e. Mann-Whitney U test was run to compare pain between two interventions. Other tests were employed as needed, including pre- and post-stratification. Significance was set at  $p < 0.05$ .

## RESULTS

100 eligible participants, evenly split by gender, aged 18 to 45, were enrolled to compare celecoxib with tramadol for pain in third molar surgery. They were divided equally into two groups: Group A (Celecoxib) and Group B (Tramadol). Table 1 showed the mean age of the patients with the gender frequency of both the groups.

**Table 1:** Demographics of Respondents (n=100)

| Variables        | Celecoxib<br>(Mean $\pm$ SD) / N (%) | Tramadol<br>(Mean $\pm$ SD) / N (%) |
|------------------|--------------------------------------|-------------------------------------|
| Mean Age (Years) | 28.72 $\pm$ 3.844                    | 28.28 $\pm$ 3.511                   |
| <b>Gender</b>    |                                      |                                     |
| Male             | 30 (60%)                             | 29 (58%)                            |
| Female           | 20 (40%)                             | 21 (42%)                            |

Table 2 showed the pain intensity levels for Group A (Celecoxib) during preoperative assessment exhibited mean values of 8.16 and a median of 8. Postoperatively, mean values decreased progressively to 7.92, 3.24, and 0.2 on the 1<sup>st</sup>, 3<sup>rd</sup>, and 5<sup>th</sup> days respectively, with corresponding median values of 8, 3, and 0. In Group B (Tramadol), preoperative pain intensity mean values were 8.34 with a median of 8, decreasing to 7.94, 4.56, and 0.8 on the 1<sup>st</sup>, 3<sup>rd</sup>, and 5<sup>th</sup> days respectively, with corresponding median values of 8, 5, and 1.

**Table 2:** Mean and Median of Pain in Two Interventions (n=100)

| Pain                                                  | Celecoxib |        | Tramadol |        |
|-------------------------------------------------------|-----------|--------|----------|--------|
|                                                       | Mean      | Median | Mean     | Median |
| Preoperational Assessment                             | 8.16      | 8      | 8.34     | 8      |
| Post-Operational Assessment of at 1 <sup>st</sup> Day | 7.92      | 8      | 7.94     | 8      |
| Post-Operational Assessment at 3 <sup>rd</sup> Day    | 3.24      | 3      | 4.56     | 5      |
| Post-Operational Assessment at 5 <sup>th</sup> Day    | 0.2       | 0      | 0.86     | 1      |

Preoperational and 1st day post-operational pain scores were similar between celecoxib and tramadol (median 8 for both), with no significant difference (p-value=0.180 and p-value=0.874, respectively). By the 3rd day post-operation, celecoxib patients reported significantly lower pain (median 3, IQR 2-4) compared to tramadol patients (median 5, IQR 4-6), with a p-value of <0.001. On the 5th day, celecoxib also showed significantly lower pain (median 0, IQR 0-1) than tramadol (median 1, IQR 0-2), with a p-value of <0.001 (Table 3).

**Table 3:** Comparison of Pain at Various Time Points Between Two Interventions (n=100)

| Pain Assessment                                    | Celecoxib Median (IQR) | Tramadol Median (IQR) | P-Value* |
|----------------------------------------------------|------------------------|-----------------------|----------|
| Preoperational assessment                          | 8 (7-9)                | 8 (6-9)               | 0.180    |
| Post-operational assessment at 1 <sup>st</sup> Day | 8 (7-9)                | 8 (7-9)               | 0.874    |
| Post-operational assessment at 3 <sup>rd</sup> Day | 3 (2-4)                | 5 (4-6)               | <0.001   |
| Post-operational assessment at 5 <sup>th</sup> Day | 0 (0-1)                | 1 (0-2)               | <0.001   |

\* Mann Whitney Test

## DISCUSSION

The challenge of achieving painless surgery persists, particularly in selecting appropriate analgesics. This study aimed to compare the pain determination of tramadol and celecoxib in mitigating pain following third molar surgery, with a focus on identifying the more effective agent in this context [8]. Third molar extraction stands as a common dentoalveolar procedure in maxillofacial surgery, often accompanied by transient postoperative discomfort. Celecoxib and tramadol are both widely employed for managing postoperative pain, trismus, and swelling. However, this investigation delves into the specific roles of tramadol and celecoxib in this surgical context [9]. Zamiri B et al., in 2009 conducted a comparative study involving ibuprofen, tramadol, and celecoxib for pain control post third molar extraction [14]. Their findings revealed superior pain severity reduction with ibuprofen compared to celecoxib at 4 and 8 hours' post-extraction, with both categories exhibiting lower severity relative to the tramadol group. In 2013, Yamaguchi and Sano explored pre-emptive analgesia for lower third molar surgery. They suggested that administering analgesics before surgery could prevent central sensitization resulting from tissue injury, NSAIDs, or acetaminophen, potentially reducing postsurgical peripheral sensitization [10]. However, their

findings indicated that the advantage of pre-emptive analgesia using NSAIDs or opioids during lower third molar surgery was not significant in relieving pain [15-19]. Akinbade AO et al., evaluated mean Visual Analog Scale (VAS) scores post-extraction, noting the lowest score in the celecoxib group ( $32.35 \pm 23.96$ ) at 4 hours, followed by ibuprofen ( $38.96 \pm 22.30$ ), and the highest score in the tramadol group ( $53.31 \pm 23.30$ ) at the same interval [15, 20]. Statistically significant differences were observed in mean VAS scores at 4 hours' post-extraction (p-value= 0.003), favoring celecoxib. Celecoxib consistently yielded lower mean VAS scores at 8, 24, and 48 hours' post-extraction, suggesting its superior analgesic efficacy post-mandibular third molar extraction compared to ibuprofen and tramadol. In our study, we assessed pain intensity using the visual analog scale, revealing mean scores of 8,3,0 in patients treated with celecoxib versus 8,5,1 in tramadol-treated patients on the 1st, 3rd and 5th days post-surgery, respectively, with statistical significance at  $p < 0.05$ . These results suggest that celecoxib demonstrates greater effectiveness in reducing pain compared to tramadol in third molar surgery.

## CONCLUSIONS

The study directly compares celecoxib and tramadol efficacy in third molar surgery, with celecoxib showing superior analgesic effects. Preoperative pain reduction on days 1, 3, and 5 was significantly greater with celecoxib compared to tramadol. Although tramadol displayed notable pain relief post mandibular third molar extraction, it was less effective than celecoxib in reducing both pain and trismus.

## Authors Contribution

Conceptualization: SKP, SS, SKP

Methodology: EI

Formal analysis: SH

Writing, review and editing: MQ, FH, ZAM

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

The authors declare no conflict of interest.

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